
Rule CIC321: A large percent of structure data elements were in use

Finding: The CICS Shared Temporary Storage (TS) Queue Server statistics showed that a large percent of structure data elements had been used in the coupling facility structure containing the shared TS pool.

Impact: This finding has a MEDIUM IMPACT or HIGH IMPACT on the performance of the CICS region.

Logic flow: This is a basic finding, based on an analysis of the data. The finding applies only with CICS/Transaction Server for OS/390 or for z/OS.

Discussion: Shared temporary storage queues are stored in named pools in an MVS coupling facility. A shared TS pool consists of an XES list structure, which is accessed through a cross-memory queue server region.

Please refer to Rule CIC320 for a discussion of shared TS pools.

The structure *alter* function provides for the expansion or contraction of the size of a structure, the reapportionment of the entry-to-element ratio of the structure's storage, and the alteration of the percentage of structure storage set aside for event monitor controls (EMCs). The structure alter processing is done either by using the IXLALTER macro or by issuing the SETXCF START,ALTER command. The IXLALTER macro allows an authorized user to request a change to the structure's size, the entry-to-element ratio, and the percentage of storage allocated for EMCs.

Starting with OS/390 Release 10, a structure can be automatically altered when it reaches an installation-defined or defaulted-to percent full threshold as determined by structure full monitoring. The alter process may increase the size of the structure, reapportion the objects within the structure, or both.

With Shared Temporary Storage, the queue server monitors the total number of entries and elements in use in the structure, using information returned by the coupling facility on every request. When the numbers in use exceed thresholds specified by the TS queue server *warning parameters*, a warning message (DFHXQ0411 or DFHXQ0412, for entries and elements, respectively) is issued. The warning message is repeated each time the number in use increases beyond further thresholds.

Each time the warning is issued, the TS queue server tests whether an automatic ALTER for the entry to element ratio should be performed. The

test is done based on the TS queue server *automatic structure alter parameters*. This is based on the ratio between the current numbers of elements and entries actually in use.

IBM suggests that no more than 75% of the structure be used to minimize the risk of the structure becoming full, to avoid triggering low space warning messages, and to avoid additional activity required to alter entry to element ratios. However, the default ELEMENTWARN and ENTRYWARN warning parameters have a default value of **80**, which specify that warnings and automatic ALTER actions should be first triggered when 80% of the elements or entries are used.

Section 2.2.2.1 (Approximate storage calculations) of the *CICS/TS System Definition Guide* provides calculations that can be used to calculate initial sizing of the storage. However, this algorithm might not yield an adequate structure size for some environments.

Further, the default element to entry ratio in the shared TS server *tuning parameters* is a simple 1:1, which might not be optimum for your shared temporary storage environment.

Consequently, CPExpert provides an earlier warning of structure element and entry shortage by analyzing the maximum number of elements and entries that were used.

Shared temporary storage queue server statistics for the coupling facility are available in MXG file CICXQ1. CPExpert uses data in CICXQ1 to calculate the maximum percent of the data elements that had been used, using the following algorithm:

$$\text{Maximum percent data elements used} = \frac{S1ELEMHI}{S1ELEMMX}$$

where S1ELEMHI = Maximum number of data elements used since last reset
 S1ELEMMX = Total data elements in the currently allocated structure

CPExpert produces Rule CIC321 when the maximum percent data elements used is more than the value specified by the **TSPCTELE** guidance variable in USOURCE(CICGUIDE). The default value for the **TSPCTELE** is 70 indicating that CPExpert should produce Rule CIC321 whenever more than 70% of the data elements had been used.

Suggestion: Rule CIC321 indicates that the TS queue server either is exercising automatic alter algorithms, or is likely to exercise these algorithms as the

thresholds in the *automatic structure alter parameters* are reached. If this finding is produced often, you should consider the following alternatives:

- Increase the initial amount of structure space that is available for the shared TS pool identified by this finding. Increasing the amount of initial structure space can be accomplished by increasing the INITSIZE (so more structure space is initially available). If more structure space is initially available, more entries and elements will be available and there is less probability that there will be a shortage of data elements.
- Increase the amount of storage allocated for the *maximum size* specified in the coupling facility resource management policy for the shared temporary storage queue identified by this finding. This action normally should be taken only if the structure size has approached the maximum size specified. Be aware that Rule CIC325 will be produced if the structure runs out of space, but frequent occurrence of Rule CIC321 might indicate a pending “no space” condition.
- You could change the TSPCTELE guidance variable in USOURCE(CICGUIDE) so Rule CIC321 is produced less often. This action is not recommended, however since you should be aware of the potential problems (it is particularly important to be aware of pending problems) revealed by Rule CIC321.

Reference: *CICS/TS for OS/390 Release 1.1*
 CICS System Definition Guide: Section 3.4.3 (Defining TS server regions)

CICS/TS for OS/390 Release 1.2
 CICS System Definition Guide: Section 3.4.3 (Defining TS server regions)

CICS/TS for OS/390 Release 1.3
 CICS System Definition Guide: Section 4.2.2 (Defining TS server regions)

 CICS/TS for z/OS Release 2.1
 CICS System Definition Guide: Chapter 21 (Starting a temporary storage server)

 CICS/TS for z/OS Release 2.2
 CICS System Definition Guide: Chapter 21 (Starting a temporary storage server)